

**WE CLAIM:**

1. A launcher for launching a foldable unmanned air vehicle having a pressure tube, the pressure tube being open at a rear end and closed at a front end, the launcher comprising:
  - a launch gas reservoir for holding launch gas;
  - a launch tube operatively connected to the launch gas reservoir and having a free end for inserting into the open end of the pressure tube of the air vehicle;
  - a free piston positioned within the launch tube; and
  - a free piston stop to prevent the free piston from leaving the launch tube, wherein a first portion of the launch gas in the launch gas reservoir is released into the launch tube and forces the free piston from an initial position to an end position at which the free piston is stopped by the free piston stop, and the movement of the free piston from the initial position toward the end position in the launch tube occurs as the air vehicle launches.
2. The launcher of claim 1, wherein the launch tube is tubular.
3. The launcher of claim 1, wherein the launch tube is configured for use with an air vehicle having a tubular pressure tube.
4. The launcher of claim 1, further comprising an air vehicle containment tube for containing the air vehicle in a folded position prior to launching and during an initial period of launching.
5. The launcher of claim 1, wherein the free piston fits in the launch tube such that a second portion of launch gas can move past the free piston and exit the launch tube through the free end prior to the free piston reaching the end position.
6. The launcher of claim 5, wherein, during launching, less than 10% of the launch gas held in the launch gas reservoir exits the launch tube through the free end prior to the free piston reaching the end position.

7. The launcher of claim 6, wherein, during launching, less than 5% of the launch gas held in the launch gas reservoir exits the launch tube through the free end prior to the free piston reaching the end position.

8. The launcher of claim 7, wherein, during launching, less than 2% of the launch gas held in the launch gas reservoir exits the launch tube through the free end prior to the free piston reaching the end position.

9. The launcher of claim 1, wherein the launch tube is for inserting into a fuselage of the air vehicle.

10. The launcher of claim 1, further comprising a valve system that prevents the launch gas in the launch gas reservoir from entering the launch tube and permits venting of the launch gas in the launch tube to outside of the launch tube so that the free piston returns to the initial position.

11. The launcher of claim 1, further comprising a hold back mechanism for engaging a feature on the air vehicle and preventing the air vehicle from moving relative to the launcher; and

a trigger mechanism for releasing the hold back mechanism from the feature of the air vehicle.

12. A portable unmanned air vehicle and launcher system comprising:  
a foldable unmanned air vehicle having a pressure tube, the pressure tube being open at a rear end and closed at a front end;  
a launch gas reservoir for holding launch gas;  
a launch tube operatively connected to the launch gas reservoir and having a free end that is positioned in the pressure tube of the air vehicle;  
a free piston positioned within the launch tube; and  
a free piston stop to prevent the free piston from leaving the launch tube,

wherein a first portion of the launch gas in the launch gas reservoir is released into the launch tube and forces the free piston from an initial position to an end position at which the free piston is stopped by the free piston stop, and the movement of the free piston from the initial position toward the end position in the launch tube occurs as the air vehicle launches.

13. The system of claim 12 wherein the launch tube is tubular.

14. The system of claim 12, wherein the pressure tube is tubular.

15. The system of claim 12, further comprising an air vehicle containment tube that contains the air vehicle in a folded position prior to launching and during an initial period of launching.

16. The system of claim 12, wherein the free piston fits in the launch tube such that a second portion of launch gas can move past the free piston and exit the launch tube through the free end prior to the free piston reaching the end position.

17. The system of claim 16, wherein, during launching, less than 10% of the launch gas held in the launch gas reservoir exits the launch tube through the free end prior to the free piston reaching the end position.

18. The system of claim 17, wherein, during launching, less than 5% of the launch gas held in the launch gas reservoir exits the launch tube through the free end prior to the free piston reaching the end position.

19. The system of claim 18, wherein, during launching, less than 2% of the launch gas held in the launch gas reservoir exits the launch tube through the free end prior to the free piston reaching the end position.

20. The system of claim 12, wherein the pressure tube is a portion of a fuselage of the air vehicle.

21. The system of claim 12, further comprising a valve system that prevents the launch gas in the launch gas reservoir from entering the launch tube and permits venting of the launch gas in the launch tube to outside of the launch tube so that the free piston returns to the initial position.

22. The system of claim 12, further comprising a hold back mechanism that engages a feature on the air vehicle and prevents the air vehicle from moving relative to the launcher; and

a trigger mechanism that releases the hold back mechanism from the feature of the air vehicle.

23. A foldable unmanned air vehicle, comprising:

a fuselage having a pressure tube portion for receiving a launch tube of a pneumatic launcher;

two wings, each wing being pivotably connected to the fuselage such that it pivots about a pivot point;

a wing retention mechanism that holds the wings in a folded position;

a foldable tail connected to the fuselage;

a tail retention mechanism that holds the tail in a folded position; and

a linkage that links the wing retention mechanism to the tail retention mechanism such that release of one of the tail retention mechanism and the wing retention mechanism releases the other of the tail retention mechanism and the wing retention mechanism.

24. The air vehicle of claim 23, wherein release of the tail retention mechanism releases the wing retention mechanism.

25. The air vehicle of claim 23, wherein the air vehicle is configured for launching from a containment tube with the wings and the tail in their folded positions.

26. The air vehicle of claim 25, further comprising a tail retention mechanism trigger for triggering the release of the tail retention mechanism when the air vehicle exits the containment tube.

27. The air vehicle of claim 26, wherein the tail retention mechanism trigger comprises spring loaded cams for pressing against the launch tube through holes in the pressure tube,

wherein the spring loaded cams are released from engagement with the tail when the launch tube is removed from the pressure tube.